NEWSLETTER

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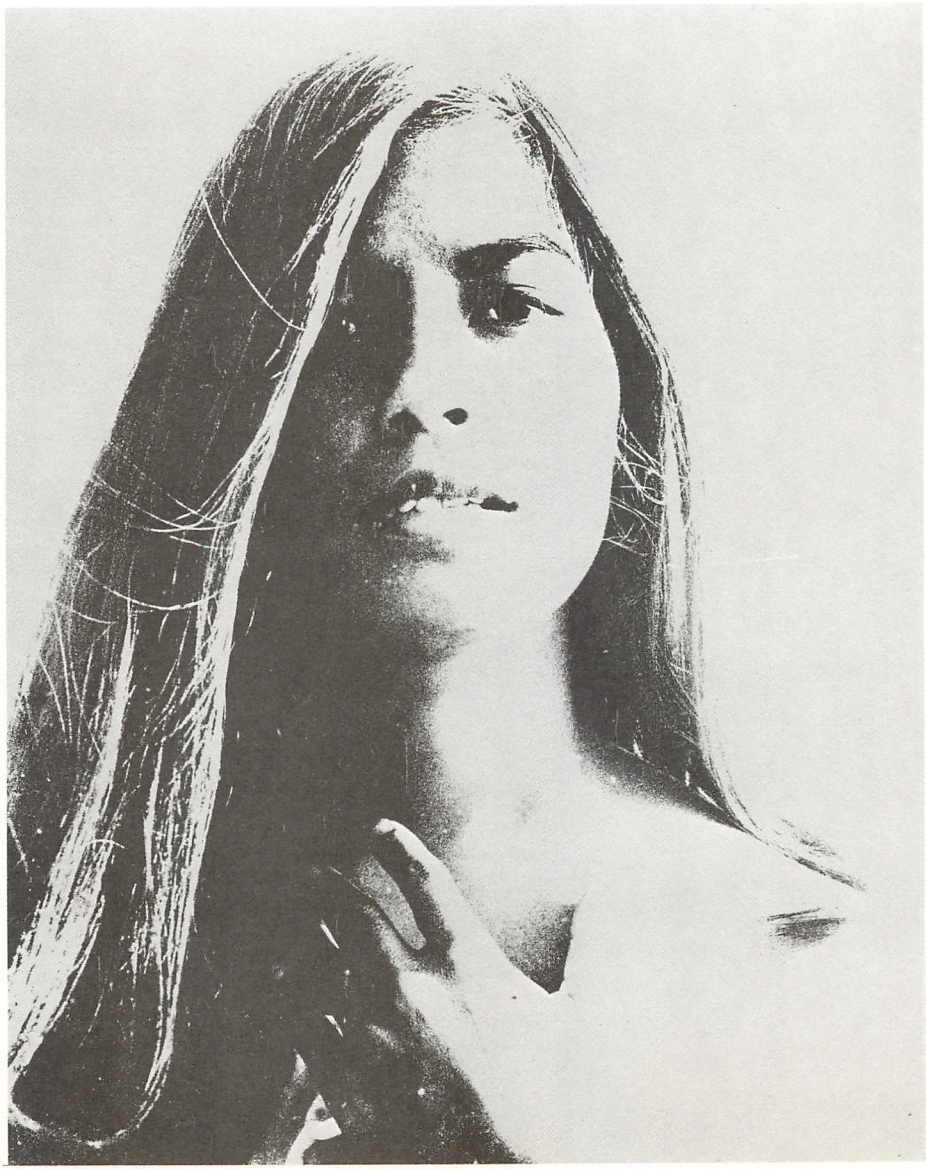


MAKING COLOR POSTERS IN YOUR DARKROOM

by

Benjamin R. Briggs

You may scarcely remember that day long ago when you first plunged a sheet of photographic paper into a tray of developer and watched in awe as that startling facimile of nature known as a photographic print emerged. The hypo that dripped on the rug in your eagerness to show that picture of Aunt Emma to your wife or mother still doesn't seem important when viewed in the light of that momentous achievement. Finally your prints were as good as those from the drug store. Then you learned about cropping, gamma, dodging, flashing, and variable contrast. And lo! Your prints were better than the drug store. They were worthy of being hung on the wall to be applauded by family and friends. "What a lovely picture of Aunt Emma. It looks exactly like her. Why you can see every line in her face!" All except Aunt Emma, who may have hinted that absolute fidelity to nature is a mixed virtue.

Much later came that night of mixed ecstasy and despair when you first made a color print. There was the agonizing moment when you asked yourself how you had failed to notice that the lovely girl you had photographed for hours had green hair.

But the day comes when all this is mere nostalgia as remote as the postcard size contact print. You have a Heathkit Colorval or a Kodak Densitometer and your first print is as good as a commercial print. You eye it critically as it comes from the bleach (if it is Agfa paper) and say, "Let's add a 5 magenta to the pack and dodge that shadow area with a 10 cyan." If you get a print that cannot be improved upon with an average of 2½ tries, you are doing as well as most custom studios.

At this point in your photographic career, you may even feel that all mountains have been climbed and all rivers swum. You may think of resting on your accomplishments for a time.

But the color printing paper that you have learned to use so well may work for you in ways you have never suspected. Learning how to use some of these less obvious properties of color printing paper may lead you to some of the most creative and fun things you have ever done since you first fitted the extra bathroom with a light proof shade and plugged a safelight in the receptical over the washstand.

What about making color prints from black and white negatives? Would you like to change the shades of gray in a black and white photograph to a rainbow of colors by a process that we shall describe as posterization?

Harken back to Aunt Emma. Did she reall appreciate perfect fidelity to nature? So why not give her a real face-lifting. Let's make a poster out of her. Dear old Aunt Emma may become worthy of looking down from the walls of a shop on Haight Street or Sunset Boulevard.

For your experiments, you will need a red, a green, and a blue filter having the filter characteristics of those used to make separation negatives for dye transfer. They may either be used in the filter drawer of your enlarger or under the lens. For under the lens use, they should preferably be of optical quality. You will need a high contrast film such as Kodalith or an equivalent made by Farrania and distributed by Freestyle in Hollywood, California. The latter is less expensive than Kodalith and results are comparable. A special developer is essential for good results with these extreme contrast films. You will also need to construct a special easel for obtaining proper registration in making your prints. A roll of tape with adhesive on both sides is useful for holding photographic paper in place on the easel. Depending upon the results you want, you may need some Farmers reducer. It is impossible to say what other things you may ultimately need because the process is limited only by your imagination.

First, let us consider a few general principles that we shall be using. For example, a fairly simple but frequently effective poster-like effect can be obtained if we take a black and white negative and enlarge it through a green filter on color printing paper. If it were developed at this point, we would have a magenta image, i.e. the shadow area that would normally be shades of gray are now shades of magenta. This first step offers a comparatively simple way of obtaining a toned print. If we now remove the negative from the enlarger and fog the paper overall with a blue filter placed in the enlarger, the magenta image will become red and the background will become yellow. For certain pictures, this color combination can be quite striking and is not unlike posterization in its overall effect. An even more dramatic effect can be achieved by converting the original negative to a high contrast positive which is then contact printed to a negative. In this two-stage process, almost all middle tones in the original negative will disappear. A subproportional reducer such as Farmers reducer may be used to "clean" the negative of any residual tones. Figure 1 outlines some of the effects possible with multiple exposures using a black and white negative. Note that in Example 4, we are able to obtain a primary color -- red, green or blue -- but that if we subsequently fog the image, it will become black. This is not entirely true since a continuous tone negative produces different amounts of dyes in different parts of the image but the fogging releases a uniform amount of dye over the whole area of the paper. Also, of course, the exposure through each filter may be varied.

The fogging described above is not the same process as solarization. Solarization may be done only during development since it exploits the inhibitory effect of some of the by-products of development. Needless to say, solarization is another area of experimentation to consider.

A word might be said here about exposure through filters. To obtain equal image intensities, the exposure through each filter must be varied. Generally speaking, the blue filter will require the longest exposure, followed by green and red. The exposure through each filter is part of your control over the process. You may well be delighted by your first random experiments, but do not neglect to experiment further. Many exciting color combinations may complement the mood of your original photograph and bring out nuances of meaning that you did not at first suspect.

The above results cannot, however, be considered as true posterization. The term "posterization" has been applied to black and white photographs having two or more sharp and distinct tonal values forming the image, usually a black and a middle gray. This posterization is usually accomplished by producing two or more high contrast negatives by different times of exposure from a positive black and white transparency. High contrast film does not produce shades of gray. Increase in exposure on such film simply results in progressively greater intrusion of black into the highlight areas covering more and more of the film area. If we expose film or paper through these negatives one at a time, we shall have what is frequently a dramatic and even startling statement of our original black and white photograph. This whole process is described in detail in the book DARKROOM MAGIC by Otto Letzel. Reading this book will serve as a worthwhile introduction to what we are now doing with color.

Although several alternative methods could be employed to achieve the results we are seeking, I have chosen a method that simplifies the problem of registration and provides a set of negatives and positives that can be used to produce dozens of different effects.

Registration is the bad three times four letter word of this process. The color effects must be produced by a sequence of exposures through different negatives and positives. To simplify the registration problem I have chosen to prepare high contrast negatives and positives the size of the intended print. The cost of a set of six high contrast films is little more than twice the cost of a single sheet of color printing paper if the less expensive Farrania film is used. The negatives are exposed and printed in a home-made easel illustrated in Figure 2. It is made from a sheet of 3/4" plywood larger than the largest print you intend to make to which two strips of wood are nailed so that the film and paper may be slipped

squarely against the edges. Paint it a dull black and use a sheet of white paper for focusing. Put some two sided adhesive tape in the bottom so that it cannot slip on the enlarger baseboard. Be sure that the corner is perfectly square. You may do your first experiments at 5 X 7 or 8 X 10, but Farrania is available in sizes up to 12 X 18 and Kodalith to 16 X 20 and even larger.

Now for some basic steps.

1. Choose a somewhat contrasty negative with reasonably well-defined shadow areas for your first try. Aunt Emmas portrait with its' well-drawn shadow area is fine. Prepare a positive transparency on conventional full scale negative film. Commercial ortho is a good choice because it can be handled under a red safelight like Kodalith or Farrania. Irrespective of the size of your original negative, make this transparency as large as your enlarger can accomodate, preferably 4 X 5.

2. Place this transparency in your enlarger. From this point on the the word is registration. Put the easel under the enlarger and focus the positive. Fasten the easel in place with clamps or tape it so that it cannot move on the baseboard. A fraction of an inch movement of the positive in the enlarger or the easel on the baseboard is synonomous with failure. All the usual admonitions against enlarger vibration also apply. Make trial exposures on strips of the high contrast film until you obtain a film that retains the image to about the desired extent, i.e. if printed would give a good representation of the subject in extreme contrast. Now make an exposure about 10% longer and 10% shorter than the negative you consider satisfactory. High contrast films have little latitude between image and no image. Always develop by the manufacturers recommendations because the film tends to fog when overdeveloped. You will now have three negatives each of which has a different amount of the original image, or simply different amounts of black area. You may remove any residual tone with Farmers reducer. Some residual tone is not always undesirable and will not destroy the poster effect. If you now remove the positive from the enlarger and print these films in sequence on black and white paper in your easel, you should obtain a perfectly registered image made up of three sharply defined gray tones.

3. Prepare a high contrast positive from each of the negatives you have prepared. These will also be perfectly registered if the exposed film is pushed tightly up against the edge of the easel followed by the negative. Use the enlarger as a light source to expose the film. Note that the film is emulsion to emulsion. Usually, the film lies flat enough so that tape is not required to hold it against the easel. These first three steps are illustrated in Figure 3. For simplicity, the continuous tone positive is represented as having only

three shades of gray. Actually, of course, the difference in density between the thinnest and densest area may be 50 fold or more.

4. Now prepare your first poster. You will probably have to use tape to hold the paper against the easel. With the six film an almost endless number of color combinations are possible. The positives are used to protect areas so that the image will not become black if more than two colors are printed over the same area. A possible sequence of printing is shown in Figure 4. Print N-3, the densest image, with a red filter. This image will be cyan. Now remove this negative and replace it with the intermediate negative, N-2. Print it with a blue filter. Your first image is now green and the second image is yellow. If you were to print N-1 with a green filter, your first image would become black, the second image red, and the final image magenta. But the first image can be protected by the positive you prepared from it. Thus this first image will remain green. Space does not permit enumerating all of the alternative possibilities.

Other ideas are sure to occur to you after you have made your first few prints. Complementary subjects may be printed over each other in multiple colors. Different texture overlays may be made over each color. Physical objects compmenentary to the subject may be laid on the easel during printing to produce shadowgraph effects.

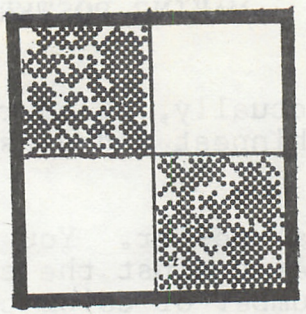
Although it may lie somewhere outside your resources, the old Technicolor movie camera which used a beam splitter to produce images on three films at the same time could be used to produce images on copy film which could subsequently be printed in colors with real objects reduced to animated posters of shifting colors.

You are by no means limited to the method chosen here. Registration devices for use in the enlarger are available. Use of the dye transfer process would permit previewing of the color effects as well as simplifying registration.

And when you show your results to Aunt Emma, you may be very surprised!

Figure 1

Negative



Example #1	Example #2	Example #3	Example #4
Green Filter	Blue Filter	Red Filter	Red Filter
M / M	Y / Y	C / C	C / C
Fog with Blue Filter	Fog with Green Filter	Fog with Green Filter	Green Filter
M+Y=R / Y	Y+M=R / M	C+M= / M	C+M= / C+M=B
Y / M+Y=R	M / Y+M=R	M / C+M=B	Fog with Blue Filter
			Black / Y
			Y / Black

M = Magenta
Y = Yellow
C = Cyan
G = Green
B = Blue
R = Red

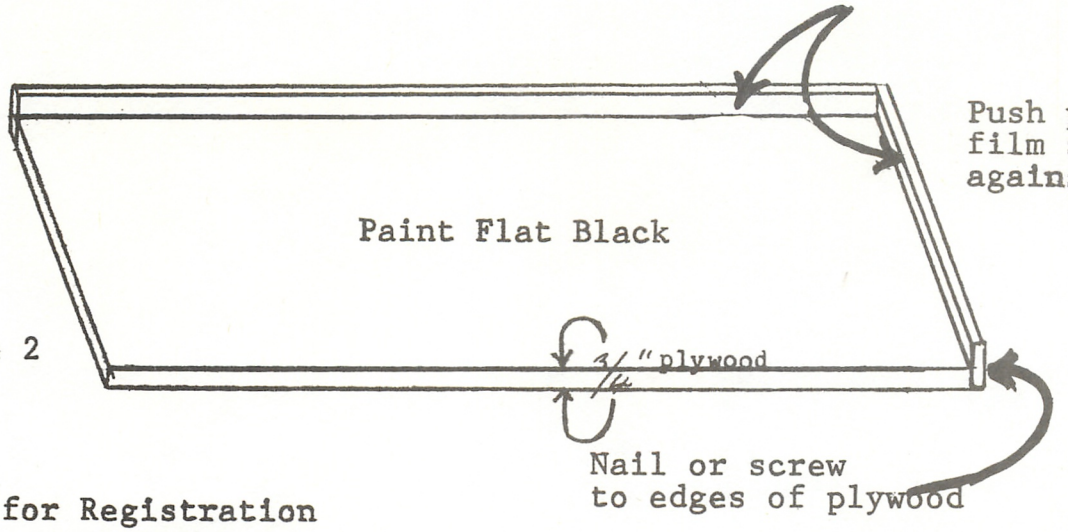


Figure 2

Easel for Registration

Figure 3

Continuous Tone

Positive

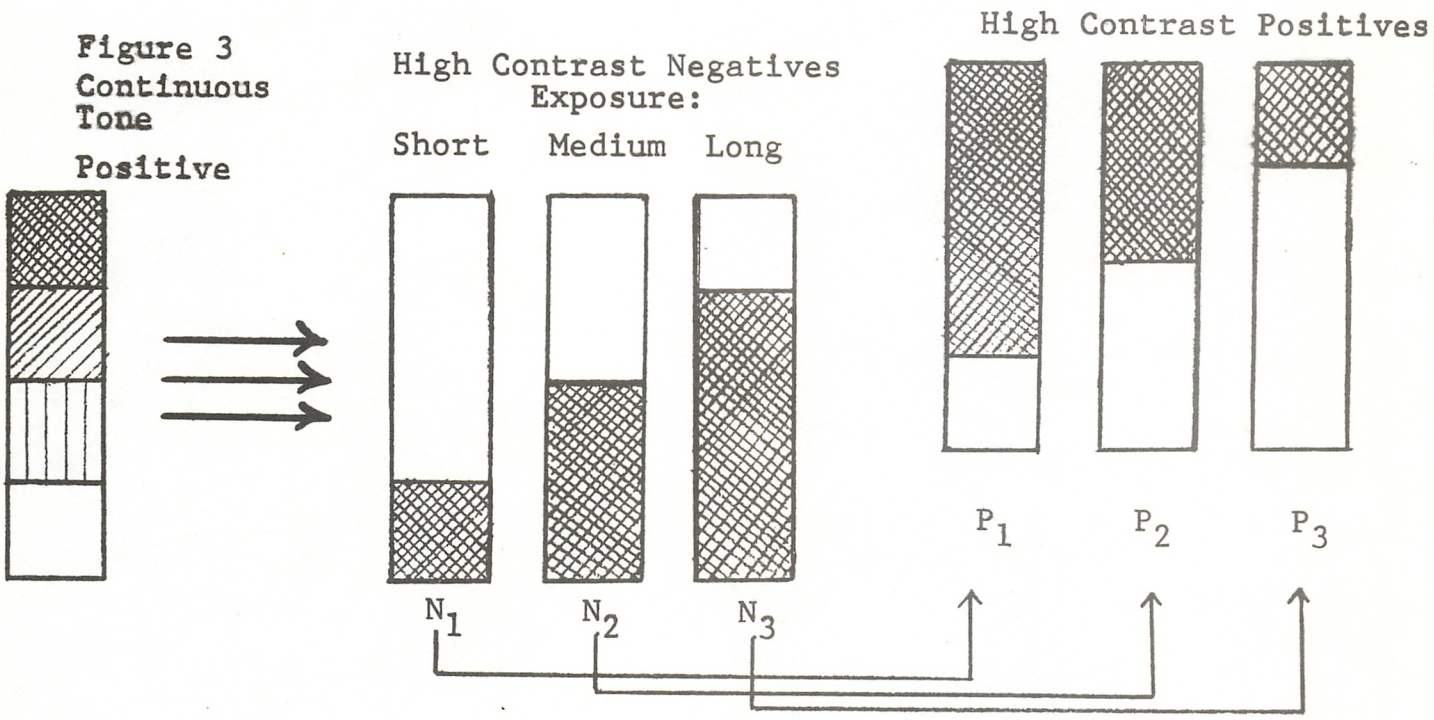
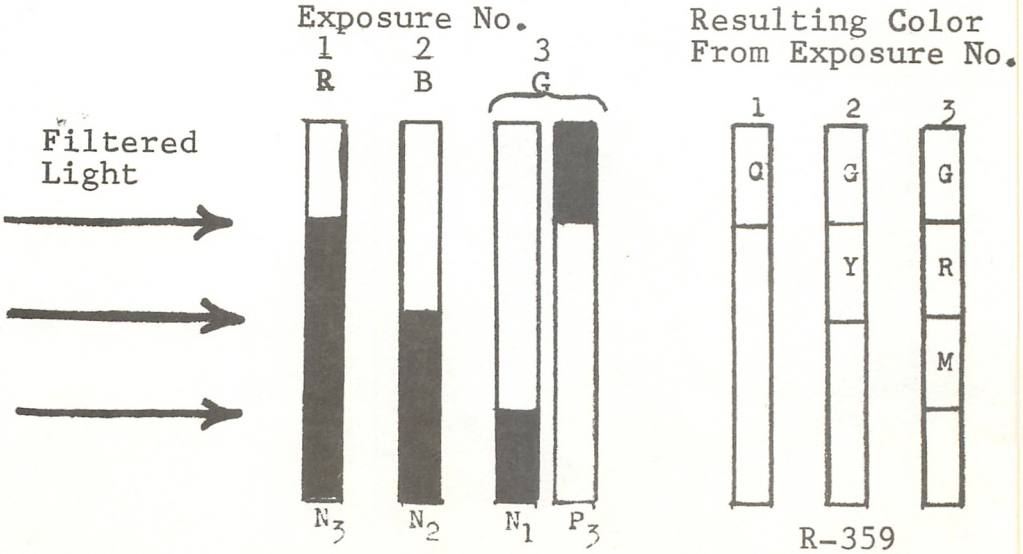
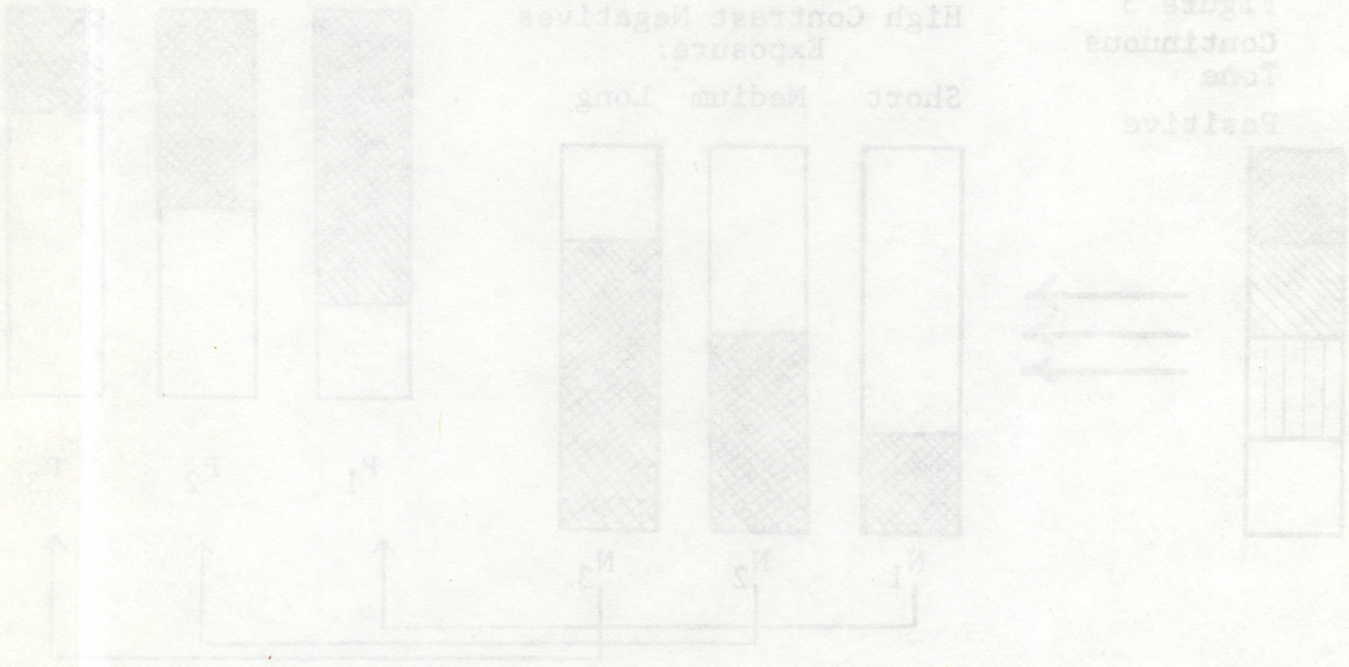


Figure 4





SIMPLIFIED SUBSTITUTIONS

OF STOCK SOLUTIONS FOR CP-5

For those that complain that they do not like to spend hours mixing and weighing chemicals, we offer the following formulas. You need only spend two nights a year weighing.

These can be used on the drum, in the canoe or in a tray.

CP-5 TIME TEMPERATURE CHART	DRUM 100°F	TRAY 75°F	TRAY 85°F
1. Pre-wetting of print	½ min.	-	-
2. Drain print	10 sec.	-	-
3. Develop	2½ mins.*	12 mins.*	6 mins.*
4. Wash	½ min.	-	-
5. Stop/fix	½ min.	4 mins.	2 mins.
Normal room light			
6. Wash	½ min.	4 mins.	2 mins.
7. Bleach	1 min.	6 mins.	3 mins.
8. Wash	½ min.	4 mins.	2 mins.
9. Formalin fixer	½ min.	4 mins.	2 mins.
10. Wash	½ min.	10 mins.	5 mins.
11. Stabilizer	½ min.	½ min.	½ min.
12. Dry			

* + 1/2°F

DEVELOPER

		Dignan Catalog No.
Stock Solution "A"		
Benzyl Alcohol	120.0 cc	(B200)
Diethylene Glycol	120.0 cc	(D380)
Distilled water	60.0 cc	
Total Stock	300.0 cc	

This stock solution will keep indefinitely - store in glass.

Stock Solution "B"		
Distilled water	800.0 cc	
Sodium Carbonate (anhy.)	125.0 grams	(S501)
Sodium Sulfite (anhy.)	5.0 grams	(S790)
Potassium Bromide	2.5 grams	(P530)
Hydroxylamine Sulfate	10.0 grams	(H650)
Distilled water to make	1000.0 cc (1. liter)	

Stock Solution "C"		
Distilled water	400.0 cc	
CD-3	75.0 grams	(DD-3)
Potassium Metabisulfite	25.0 grams	(P650)
Distilled water to make	500.0 cc	
Total Stock	500.0 cc	

To make working solution of one liter:

Start with water	730.0	cc
Stock Solution "A"	30.0	cc
Stock Solution "B"	200.0	cc
Stock Solution "C"	40.0	cc

The Stock Solution of "A" will dissolve rapidly if the water used to make the working solution is heated to approximately 125°f - stir 4 or 5 minutes - then let the water cool to approximately 90°f before adding Stock Solution "B". Then add the 40. cc of Stock Solution "C". The Stock Solutions of "B" and "C" will keep for at least six months in full, tightly stoppered glass bottles.

STOP-FIXER "A"

		Dignan Catalog No.
Ammonium Thiosulfate (60%)	250.0 cc	(A690)
Distilled water	750.0 cc	
Total Stock	1000.0 cc	

STOP-FIXER "B"

Distilled water	700.0 cc	
Potassium Metabisulfite	250.0 grams	(P650)
Distilled water to make	1000.0 cc	
Total Stock	1000.0 cc	

Before use of Solution "A" add 50. cc of Stock Solution "B" to each 500. cc's of "A".

BLEACH STOCK SOLUTION

Distilled water	700.0 cc	
Potassium Ferricyanide	125.0 grams	(P580)
Potassium Bromide	100.0 grams	(P530)
Boric Acid (crystals)	25.0 grams	(B350)
Borax ($10H_20$)	12.0 grams	(B301)
Distilled water to make	1000.0 cc	

Working solution: 200. cc of the above to 800. cc of water will make 1.0 liter.

FORMALIN FIXER STOCK SOLUTION

Distilled water (80°f)	600.0 cc	
Sodium Thiosulfate	260.0 grams	(S810)
Sodium Sulfite (anhy.)	20.0 grams	(S790)
Boric Acid (crystal)	8.0 grams	(B350)
Formalin (37%)	40.0 cc	not carried
Distilled water to make	1000.0 cc	

For use dilute with one part water.

STABILIZER STOCK SOLUTION

Distilled water (90°f)	700.0 cc	
Sodium Diacetate	40.0 grams	(S540)
Zinc Sulfate	20.0 grams	(Z100)
Ethylene Glycol	160.0 cc	(E782)
Photo Flo "600"	4.0 cc	(P440)
Distilled water to make	1000.0 cc	

For use dilute with one part water.

GET THE HYPO OUT -- OUT -- OUT!

by

D. William Reichner

Browsing in a bookstore in the musty magazine section can sometimes be very rewarding. I recently came across a copy of the Journal of Research of the National Bureau of Standards - C., Engineering and Instrumentation, Volume 67C, No. 1, January through March, 1963. In this journal are found such articles as "Method for Calibrating a Standard Volt Box" and "Equipment for Single Crystal Growth from Aqueous Solution." After these have whet your interest, you can learn about "An Oxygen Partial Pressure Warning Instrument." I must admit that I really could not recommend the above articles for entertaining diversion, however, one other article had some merit for consideration. It is a very academic and thorough paper by C. I. Pope entitled "Stability of Residual Thiosulfates in Processed Microfilm."

At first glance, the subject matter did not appear to be very pertinent for the photographer who deals with "normal" films. After digging through the mass of data, procedures and formulas in this article, however, it became obvious that this is indeed of practical use for the general photographer and his processing procedures.

It is true that Pope deals mainly with the high image density uses for the very thin emulsion microfilms. However, in keeping with accepted scientific inquiry methods, he does provide information about lower densities (appropriate to normal B & W films).

As the relative humidity of the air increases in the storage areas for microfilm records, the rate of decomposition of residual thiosulfate (hypo remaining in the film) increases. This residual thiosulfate reacts with the silver in the image to form silver sulfide which will damage or destroy the image. The concentration of residual thiosulfate in the film varies with the image density and emulsion thickness. The problem, then, is to find a way to eliminate the hypo completely from the film after fixation of the image and before storage.

There are other factors besides image density and thickness of the emulsion that result in hypo being retained in processed film. The most obvious is inadequate washing. Some less obvious reasons were also found. The fixing bath itself will influence the amount of residual hypo in the film if the bath is not fresh. As the fixer is used, it accumulates silver salts (silver thiosulfate complex), the presence of which makes it difficult to remove the hypo by washing.

Washing for one hour, even after using fresh fixer, does not completely remove thiosulfate from the high image density areas of the film. Even after-treatment in alkali solutions did not completely remove hypo.

Tests were made using the formula for hypo removal first proposed by Crabtree, Eaton, and Muehler in 1941. This formula, which follows, is referred to as Kodak HE-1 in the Photo Lab Index.

HE-1 HYPO ELIMINATOR

Water	500.0 cc
Hydrogen Peroxide (3.0% Sol.)	125.0 cc
Ammonium Hydroxide (3.0% Sol.)	100.0 cc
Water to make	1.0 liter

The film was fixed in fresh Kodak F-5 Fixer, washed in running water at 70°F for 3 minutes, treated in HE-1 at 68°F for 10 minutes, and then washed in running water at 77°F for 15 minutes.

The results: The residual thiosulfate was about the same as when film was fixed in fresh Kodak F-5 Fixer, and then washed for 1 hour in running water.

After elaborate experimentation, in particular, the examination of the reasons why washing film in sea water produced less residual hypo, Pope came up with two methods for eliminating ALL traces of hypo in microfilm.

1. By adding 1.0 gram per liter of Potassium Iodide (Dignan Catalog No. P-600) to the fixer, the thiosulfate can be completely washed out rapidly (5 minutes in 77°F running water).

2. By adding 1.0 gram per liter of Potassium Bromide (Dignan Catalog No. P-530) to the HE-1 formula, the residual silver thiosulfate complex ions were then decomposed and the released thiosulfate ions were readily removed by washing or oxidation.

The complete procedure with the modified HE-1 formula as used with microfilms was as follows:

Fixing (in modified F-5 fixer) for normal time and temperature.

Washing in running water for 3 minutes at approximately 77°F

Modified HE-1 for 10 minutes at 68°F

Clearing Bath (formula below) for 2 minutes at 68°F.

Washing in running water for 15 minutes at approximately 77°F

CLEARING BATH

		Dignan Catalog Number
Water 95°F)	800.0 cc	
Sodium Sulfite (Anhyd)	10.0 grams	S-790
Water to make	1.0 liter	

The results: Absolutely no measurable traces of residual thiosulfate. Now, that is ARCHIVAL permanence!

There may be some concern as to just how useful this information is with "normal" black and white films, after all, microfilm is different from the usual black and white film! Well, yes and no.

Yes, microfilm is usually a relatively slow speed film having a remarkably high resolving power. One type in particular, Agfa Agepe FF, is orthochromatic in sensitivity, resolves 280 lines/mm, has a 5 micron emulsion thinness, and a rating of about ASA 12, with an anti-halation backing which dissolves in the developer on a clear acetyl-cellulose safety base. It is ideal for photographing fine or detailed line drawings.

No, microfilm can be used for continuous tone reproduction by developing in appropriate solutions.

Removal of hypo from any fixed film is important. The advantage we have in working with normal film at normal densities is that the measures needed to achieve hypo-free film need not be as elaborate as those used with microfilm.

Normal films, which usually have thicker emulsions and bases, require, as Kodak recommends, washing times of about 30 minutes in running water at about 75°F. This is, of course, without the use of any addition to the fixer or without any special after baths.

Applying the information found above to the "normal" film processing, the following procedure is suggestsd as a means of achieving minimal hypo retention and shorter "wet time."

Fixing (in modified fixer) at normal time and temperature.

Washing in running water for 3 minutes at approximately 77°F

Modified HE-1 for 5 minutes at 68°F

Washing in running water for 7 minutes at approximately 77°F

Capacity of modified HE-1: 12 rolls of 120 film or equivalent area per liter.